EPA/ROD/R05-92/216
1992

EPA Superfund
Record of Decision:

HAGEN FARM
EPA ID: WID980610059
OU 02
STOUGHTON, WI
09/30/1992

HAGEN FARM SITE, WI GROUNDWATER CONTROL OPERABLE UNIT

DECLARATION FOR THE RECORD OF DECISION

Site Name and Location
Hagen Farm Site, Groundwater Control Operable Unit
Dane County, Wisconsin

Statement of Basis and Purpose

This decision document represents the selected remedial action for the Hagen Farm Site (the "Site"), in Dane County, Wisconsin, Groundwater Control Operable Unit, which was chosen in accordance with the Comprehensive Environmental Response Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

This decision is based on the Administrative Record for the Hagen Farm site.

The State of Wisconsin concurs with the selected remedy on the condition that, at the time that the proposed treatment design is finalized, the State determines that the proposed effluent discharge limits and discharge location are acceptable to the State.

Assessment of the Site

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of Remedy

This Groundwater Control Operable Unit is the second of two operable units for the Site. For purposes of this ROD, the "Site" is defined as the area within the Hagen Farm property boundary and the contaminant plume. The selected remedial action for this operable unit addresses the groundwater contamination by remediation of contaminated groundwater. For purposes of this ROD, "on-property groundwater" is defined as contaminated groundwater on and in the immediate vicinity of the main waste disposal area and "offproperty groundwater" is defined as contaminated groundwater at any location within the plume other than in the area defined as on-property groundwater.

The major components of the selected remedy include:

- Monitoring of all private wells located around the Site;
- Pre-treatment of extracted on- and off-property groundwater;
- Extraction and treatment of groundwater;
- Treatment of on-property groundwater using Activated Sludge Biological Treatment;
- Treatment of off-property groundwater using a treatment technology to be determined during the design phase;
- Discharge of treated groundwater to wetlands or the Yahara River;
- Treatment and disposal of sludges generated from the groundwater treatment and treatment of off-gas emitted from the treatment process;
- Deed and access restrictions to prevent installation of drinking water wells within the vicinity of the disposal areas and off property; and
- Implementation of a bench scale study to determine the effect of nutrients and/or oxygen on contaminated groundwater. If the bench scale study shows positive results, a pilot study would be conducted, with the ultimate goal of enhancing the selected remedy with an in-situ groundwater bioremediation system.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State environmental requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy will result in hazardous substances remaining on-site, a review will be conducted within five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

RECORD OF DECISION

DECISION SUMMARY

HAGEN FARM SITE

GROUNDWATER CONTROL OPERABLE UNIT
DANE COUNTY, WISCONSIN

Prepared By:

U.S. Environmental Protection Agency

Region V

Chicago, Illinois

September, 1992

TABLE OF CONTENTS

ROD SUMMARY
HAGEN FARM SUPERFUND SITE
GROUNDWATER CONTROL OPERABLE UNIT
DANE COUNTY, WISCONSIN

I. SITE LOCATION AND DESCRIPTION

The Hagen Farm Site (the Site) is located at 2318 County Highway A, approximately one mile east of the City of Stoughton, Dane County, Wisconsin. The Site is defined as the area within the Hagen Farm property boundary and the contaminant plume. The property is approximately 28 acres in size and is located in the northeast quarter of the southeast quarter of Section 10, Township 5 North, Range 11 East. Within the property boundary is approximately 10 acres of disposal area. The Site, as a whole, is situated in a rural surrounding that is dominated largely by sand and gravel mining and agriculture. Sand and gravel mining operations are located northwest, northeast, and south of the Site. The Stoughton Airfield is located adjacent to the northwest corner of the Site. County Highway "A" passes just south of the property boundary (See Figure 1).

The City of Stoughton's municipal wells are located approximately two miles to the west. Three private wells are located approximately 1000 feet west of the Site, and eight private wells are located within 4,000 feet downgradient from the Site based on hydrogeology information obtained during investigation at the Site (See Section V below). The private wells located at the Site were abandoned in accordance with NR 112 and are no longer in use. Approximately 350 people reside within one mile of the Site.

The Site is located in the Yahara River watershed, in an area of flat to gently rolling topography. The Yahara River is located approximately 1.3 miles to the west and flows in a southerly direction. The Site does not lie within the 100-year flood plain. The land surface generally slopes toward the Yahara River from topographically high areas located to the northeast and east. Surface-water drainage in the area is generally poorly developed, apparently due to permeable surface soils. The only substantial surface water bodies in the area are Sundby's pond located approximately 1/2 mile south of the Site and the Yahara River. An on-Site ditch is located at the southeast corner of the property which flows to a wetland. This wetland is located directly south of the Site. There is no designated Wisconsin State significant habitat, or historic landmark site directly or potentially affected. No endangered species are known to inhabit the Site.

The Site is located in an area dominated by glacial outwash deposits, which extend approximately one-half mile to the northeast. These deposits are dominated by sand and gravel. Beyond this, ground moraine and occasional drumlins are encountered. Lacustrine deposits associated with Glacial Lake

Yahara are located approximately one-eighth of a mile south. Bedrock, primarily sandstone and dolomite, underlie the glacial deposits in this area. Bedrock generally slopes from the west to southwest, toward a preglacial valley associated with the Yahara River. The depth to bedrock ranges from 50 to 80 feet near the Site. Groundwater is present approximately 10 to 40 feet below ground surface near the Site. Groundwater flow is predominantly to the south-southwest, toward the Yahara River, a regional groundwater discharge zone. Estimated groundwater velocities ranged from 1.2 ft/yr to 145 ft/yr.

The current Site topography is the result of sand and gravel mining and waste disposal activities. Prior to these activities, the ground surface probably sloped from the existing topographically high area located west and northwest toward the southeast and east. The excavated area in the northwest corner of the property is flat. This flat area is separated by a ridge from the water-filled depression located to the northeast.

Within the Site's "area of contamination" (AOC), waste disposal took place within three subareas. These subareas are A (6 acres, located in the southern portion of the property), B and C (1.5 acres each, located in the northeastern portion) (See Figure 2). All three subareas reside within the Site's formally defined AOC. Subareas B and C have been consolidated into the disposal area A. Disposal area A has been capped and vegetated. These consolidation and capping activities were conducted as part of the Source Control Operable Unit (see ROD in this matter dated September 17, 1990).

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Site was operated as a sand and gravel pit prior to the late 1950s. Observations suggest gravel operations encompassed an area bounded by the current access road to the east, the former Schroeter property boundary to the west, and the current property boundary to the north (See Figure 2). Mining operations reportedly terminated approximately 14 to 18 feet below ground surface. Excavation may have ceased at this depth due to the presence of groundwater, more fine grained materials, or a change in sand and gravel quality.

The gravel pit was then used for disposal of waste materials from the late 1950s to the mid-1960s. During the period that the Site was operated as a disposal facility, the property was owned by Nora Sundby, since deceased. The property was then purchased from Nora Sundby by Orrin Hagen in November 1977. The Site is currently owned by Waste Management of Wisconsin, Incorporated (WMWI). The Site was operated by City Disposal Corporation. City Disposal Corporation was subsequently purchased by WMWI. City Disposal was also the transporter of much of the waste that was deposited at the Site. It is known

that Uniroyal, Incorporated (Uniroyal) generated industrial waste, some of which was deposited at the Site beginning sometime in 1962 and continuing through August 1966.

Waste solvents and other various organic materials, in addition to the municipal wastes, were disposed of at the Site, including acetone, butyl acetate, 1-2-dichloroethylene, tetrahydrofuran, solid vinyl, sludge material containing methyl ethyl ketone and xylenes, and toluene. In a 103(c) Notification submitted to the United States Environmental Protection Agency (U.S. EPA) by Uniroyal, in June 1981, Uniroyal indicated that F003 and F005 wastes (spent non-halogenated solvents), which are hazardous wastes within the meaning of the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 6901, also were disposed of at the Site. This site stopped accepting waste in 1966, prior to regulation of hazardous waste disposal by RCRA Subtitle C.

Beginning in November 1980, in response to complaints received from local residents, the Wisconsin Department of Natural Resources (WDNR) began conducting groundwater sampling at nearby private water supply wells. Sampling of the on-Site monitoring wells during the period 1980-1986 indicated certain organic compounds were present in the groundwater, including benzene, ethylbenzene, tetrahydrofuran (THF), xylenes, and toluene.

In addition, nearby private water supplies on adjacent properties also contained detectable levels of volatile organic compounds (VOCs). The private wells located on adjacent properties had been impacted by acetone, THF, vinyl chloride, xylene, trans-1,2-dichlorethene, and trichloroethylene.

In 1983, the State of Wisconsin brought an enforcement action for abatement of a public nuisance against WMWI and Uniroyal. At the same time, nearby residents to the Site brought a civil action against WMWI and Uniroyal, seeking civil damages for reduced property values and potential health hazards resulting from groundwater and well contamination. The State of Wisconsin obtained a dismissal of its 1983 enforcement action against WMWI and Uniroyal after the Site was listed on the National Priorities List (NPL). In 1986, the parties to civil litigation brought by the nearby residents to the Site against WMWI and Uniroyal reached a settlement. The exact terms of the settlement are confidential. It is known, however, that one of the terms of the settlement required WMWI to purchase the Site property from Orrin Hagen, as well as other property located adjacent to the Site. Upon acquiring these properties, WMWI razed the structures constructed thereon.

The Site was proposed for inclusion on the NPL on September 18, 1985. The Site was placed on the NPL in July 1987. Subsequently, WMWI and Uniroyal, the two potentially responsible parties (PRPs) named by U.S. EPA in connection with the Site to date, entered into an Administrative Order by Consent (U.S. EPA Docket No. VW 87-C-016, dated September 14, 1987) (the Consent Order) with U.S. EPA and WDNR. In the Consent Order, WMWI and Uniroyal agreed to conduct a Remedial Investigation and Feasibility Study (RI/FS) at the Site. Accordingly, in July 1988, upon U.S. EPA approval, in consultation with the WDNR, of the required Work Plans, fieldwork at the Site commenced.

Two operable units (OUs) have been defined for the Site. OU I, which is the Source Control Operable Unit (SCOU), is intended to address waste refuse and sub-surface soils (Waste/sub-Soils) at disposal area A and the two smaller disposal areas B and C. OU II, which is the Groundwater Control Operable Unit (GCOU), is intended to address the contaminated on- and off property groundwater at the Site. For purposes of this ROD,

"on-property groundwater" is defined as contaminated groundwater on and in the immediate vicinity of the main waste disposal area and "off-property groundwater" is defined as contaminated groundwater at any location within the plume other than in the area defined as on-property groundwater. The OU approach was agreed upon after discussions among U.S. EPA, WDNR, and the PRPs during the early phase of the implementation of the Work Plan for the RI. This ROD is developed for the GCOU, which is OU II.

The RI for the SCOU was completed in early 1989, and the ROD was signed on September 17, 1990. An Explanation of Significant Differences was issued in April of 1991. Subareas B and C were consolidated into the disposal area A and the construction of the Landfill Cover over the main disposal area A, which is one of the components of the selected remedy for the SCOU, was completed in May 1992. Prior to the implementation of the Landfill Cover, wastes from areas B and C were consolidated into the main disposal area A. The implementation of In-Situ Vapor Extraction, which is also part of the selected remedy for the SCOU, was initiated in May 1992. The RI for the GCOU was initiated in July 1989 and the final RI report was submitted in November 1991. An Alternative Array was prepared in July 1991, which provided a preliminary description of the technical methods under consideration for cleaning up the groundwater. Based on the evaluation and screening of technical methods available for addressing the groundwater contamination in the Aternative Array, a draft Feasibility Study (FS) report was submitted in October 1991. The draft FS was revised in order to include off-property contaminated groundwater in January 1992, and finalized in April 1992. The FS Report for the GCOU outlines the final alternatives under consideration for correcting contamination problems found in the groundwater, and provides a thorough evaluation of each alternative.

III. COMMUNITY RELATIONS ACTIVITIES

Upon the signing of the Consent Order in July 1987, U.S. EPA held a 30-day public comment period. A press release was sent to all local media and advertisements were placed.

A Community Relations Plan for the Site was finalized in July 1988. This document lists contacts in the government and interested parties throughout the local communities. It also establishes communication pathways to ensure timely dissemination of pertinent information.

An RI "Kickoff" meeting was held on July 14, 1988 to explain the RI process. A fact sheet was developed in conjunction with this meeting. Advertisements were placed in the Madison Capital Times and Stoughton Courier-Hub and a press release was sent to all local media.

A press release was sent to local media on March 27, 1989 to update the community on the progress of Dane County, Wisconsin Superfund sites, including Hagen Farm.

A public meeting was held on July 27, 1989 to explain the findings of the RI and the operable unit approach. A fact sheet was developed in conjunction with this meeting. Advertisements were placed to announce the meeting and a press release was sent to all local media. Prior to the public meeting, U.S. EPA representatives held a separate briefing for Town officials.

A public meeting was held on August 2, 1990, to present the recommended remedy for the SCOU. Advertisements were placed to announce the meeting and a press release was sent to all local media. A public comment period was held from July 11, 1990, to August 10, 1990. All comments received by U.S.
EPA during the public comment period and at the public meeting were addressed in the Responsiveness Summary of the SCOU ROD.

A public meeting was held on August 29, 1991, to provide the public with an update on the progress for the SCOU and the GCOU at the Site. A fact sheet was developed in conjunction with this meeting. Advertisements were placed to announce the meeting and a press release was sent to all local media.

The RI/FS and the Proposed Plan for the GCOU were released to the public in May 1992. All of these documents were made available in the information repositories maintained at the Stoughton Public Library and Klongland Realty. An administrative record file containing these documents and other site-related documents was placed at the Stoughton Public Library. The notice of availability of these documents was published in the Stoughton Courier-Hub, Wisconsin State Journal, and Madison Capital Times on May 27,

1992. Press releases were also sent to all local media. A public comment period was held from June 1, 1992 to July 1, 1992. The request for an extension of the comment period was made and the public comment period was extended until July 31, 1992. In addition, a public meeting was held on June 11, 1992 to present the results of the RI/FS and the preferred alternative as presented in the Proposed Plan for the Site. All comments received by U.S. EPA during the public comment period are addressed in the Responsiveness Summary which is the third section of this ROD.

As sampling results from private wells became available, U.S. EPA wrote letters to the property owners to inform them of these results. These letters were mailed in September 1989 and December 1990.

IV. SCOPE AND ROLE OF RESPONSE ACTION

As discussed in Section II above, U.S. EPA has divided the Site into two operable units. The SCOU addresses waste refuse and sub-surface soils at disposal area A and the two smaller disposal areas B and C. The GCOU, which is the subject of this ROD, is intended to address the contaminated on-and off-property groundwater at the Site.

U.S. EPA identified contaminated on- and off-property groundwater as posing potential risks to human health and the environment. To address these risks, U.S. EPA developed the following remedial objectives for the GCOU based on the data obtained during the RI:

1) Restore groundwater so that contamination levels meet appropriate Federal and State groundwater quality standards;

2) Stop the flow of contaminated groundwater downgradient of the Site and to the Yahara River; and

3) Prevent the flow of contaminated groundwater to residential wells.

This ROD was developed to meet these objectives and it addresses the contamination problems identified in the GCOU, namely the on- and off-property groundwater contamination at the Site. This response action is being implemented to protect human health and the environment from risks posed by the contamination problems.

This present response action, by addressing contaminated on- and off-property groundwater, is fully consistent with all future site work, including the on-going Remedial Design and Remedial Action (RD/RA) for the SCOU at the Site.

V. SUMMARY OF SITE CHARACTERISTICS

In November 1991, an RI Report for the GCOU was completed under the guidance and oversight of U.S. EPA and WDNR. The RI for the GCOU was to determine the nature and extent of contamination in the groundwater, and evaluate possible exposure pathways. The report summarized all soil-boring, surface water, on- and off-property groundwater, private well, pump test, and treatability study analytical data that had been collected. The RI report should be consulted for a more thorough description of the Site characteristics.

The following are the results of the RI at the Site:

- The uppermost aquifer at the Site is the glacial sand and gravel aquifer. This aquifer is unconfined with groundwater present approximately 10 to 40 feet below ground surface near the Site. The sandstone bedrock aquifer is located below the glacial sand and gravel aquifer. The saturated thickness of the unconsolidated sand and gravel aquifer generally ranges from 30 to 40 feet on site and 50 to 100 feet off site. The thickness of the bedrock aquifer is unknown. Based on the contact of the sand and gravel aquifer with the bedrock aquifer and the insignificant difference between water levels in the sand and gravel and bedrock wells, it appears that the two aquifers are hydraulically connected.

- Groundwater flow immediately beneath the main disposal area (Area A) is predominantly toward the southeast, but then rotates to a southerly and southwesterly direction immediately downgradient of disposal area A. Groundwater flow south of County Highway A appears to be generally southerly to southwesterly, with

fairly uniform horizontal gradients. Groundwater velocities ranged from 1.2 to 145 feet per year.

- It does not appear that Sundby's pond functions as a local groundwater discharge area; groundwater flow appears to be horizontal or slightly downward beneath the pond. Data also indicate that the nearby drainage ditch is probably not a potential groundwater discharge point.

- The constant rate pumping test was run for 33 hours. During this test, 119,000 gallons were pumped from the aquifer resulting in a cone of depression extending out approximately 400 feet. This test indicates that the aquifer behaves as an unconfined aquifer with some degree of connection to the sandstone bedrock. Results showed an average transmissivity of 24,000 gallons per day per foot.

- The contaminants causing the most concern are VOCs. The elevated levels of VOCs detected in groundwater were THF (630,000 parts per billion (ppb)), ethylbenzene (4,400 ppb), toluene (2,700 ppb), and xylenes (37,000 ppb). Benzene (8 ppb), 1,1-dichloroethene (1 ppb), and vinyl chloride (77 ppb) were also detected in the groundwater. Inorganic compounds such as arsenic (25.2 ppb), barium (1,570 ppb), iron (17,000 ppb), lead (6 ppb), manganese (3,300 ppb), and mercury (6.5 ppb) were also found in the groundwater. Aroclor-1242 (0.25 ppb), arsenic (31.9 ppb), lead (997 ppb), cadmium (35.6 ppb), chromium (109 ppb), and mercury (1.0 ppb) were detected in the leachate from the landfill.

- The occurrence, concentration, and distribution of THF suggest there is a THF plume originating in the south-central section of disposal area A which extends downgradient (south) approximately 3,600 feet to between test boring #1 and well nest #34 (See figure 3).

- Private wells determined to be potential receptors were sampled in September 1989, August 1990 and September 1991. VOCs were not detected in private well samples collected during this investigation.

- A treatability study was conducted during the on-property pump test. The results of the treatability study indicate that air stripping can attain removal levels as high as 40 percent of the THF concentration in the sample tested. It is estimated that a cascade aeration system will remove up to 30 percent of the THF, with higher removal efficiencies for other VOC contaminants. Granular activated carbon (GAC) is an effective technology to remove VOCs by itself and also in combination with biological treatment. However, two of the contaminants, THF and 2-butanone, are not readily adsorbable. An activated sludge system can remove up to 99 percent of the THF and other organic compounds in the groundwater. UV-chemical oxidation should remove up to 99 percent of the contaminants.

VI. SUMMARY OF SITE RISKS

The baseline risk assessment was conducted to characterize the current and potential future threat to public health and the environment posed by chemicals in the groundwater originating at, or migrating from the Site. Both current and potential future-use conditions were examined in the baseline risk assessment. Under current conditions, the Site was assessed in the absence of remedial action for groundwater.

A risk assessment consists of four primary parts: identifying chemicals and other contaminants of concern; assessing pathways through which humans, plants, and animals could be exposed to contamination; assessing the toxicity of the contaminants; and characterizing cancerous and non-cancerous health effects on humans.

a. Human Health Risks

1. Contaminant Identification

The first step of the risk assessment was to select chemicals and other contaminants of potential concern for detailed evaluation. This was conducted by summarizing and evaluating RI data, including a consideration of naturally occurring background levels and the presence of chemicals in blank samples. Based on this evaluation, 56 chemicals of potential concern were selected for detailed assessment. These chemicals were considered most likely to be of concern to human health and the environment. The following compounds were selected as the chemicals and other contaminants of potential concern:

Organic Compounds		Metals
Acetone	Benzene	Arsenic
Benzoic acid	Benzyl alcohol	Barium
2-Butanone	Chlorobenzene	Copper
Chloromethane	1,1-Dichloroethene	Manganese
1,4-Dichlorobenzene	1,2-Dichloroethene	Mercury
4,4'-DDE	Dieldrin	Nickel
Diethylphthlalate	2,4-Dimethylphenol	Vanadium
Ethylbenzene	4-Methylphenol	Zinc
Naphthlalene	Di-n-octylphthalate	
Phenol	Tetrahydrofuran	
Toluene	Vinyl acetate	
Vinyl chloride	Xylenes (total)	

These contaminants were detected in both on- and off-property groundwater. Table 1 identifies the maximum concentration of contaminants in groundwater.

2. Exposure Assessment

An exposure assessment was conducted to identify potential pathways of exposure under current and future Site and surrounding land-use conditions. The following pathways were selected for detailed evaluation under current use conditions (Although no current private wells located around and downgradient of the Site are impacted by the contaminated groundwater, the assumptions were made that the private wells located in the near and far downgradient of the Site might be impacted due to the potential for groundwater flow changes.):

- Ingestion of groundwater; and

- Inhalation of VOCs by residents located near and far downgradient of the Site while showering.

Under future-use conditions, the following pathways were selected for evaluation:

- Ingestion of groundwater by a future resident on the Site; and

- Inhalation of VOCs while showering by a future residents on the Site.

For the ingestion of groundwater by current and future residents, adult residents were assumed to weigh 70 kg and ingest two liters of water per day, 350 days per year and to live in the same location for 30 years of their 70-year expected lifetime. For the inhalation of VOCs while showering, an exposure time of 17 minutes, a frequency of exposure of 350 days per year, and a duration of exposure of 30 years were assumed.

The maximum concentration of contaminants of concern was used for groundwater to calculate the risk. For the inhalation exposures while showering, the exposure point concentrations were calculated using a shower model.

3. Toxicity Assessment

The harmful effects, or toxicity, of a chemical in terms of its potential cancerous and non-cancerous health effects were evaluated. Research was conducted to determine the toxicity of chemicals, and the results and conclusions of this research were used in the evaluation of the toxicity of Site-related contamination. In the research of a chemical's toxicity, the effects of low levels of chemical exposure on people in the workplace are studied over long periods of time, and test animals are studied in laboratories, where animals are exposed to varying levels of chemicals over different lengths of time.

Cancer slope factors have been developed by U.S. EPA's Carcinogen Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. Slope factors, which are expressed in units of (mg/kg-day)[-1], are multiplied by the estimated intake of a potential carcinogen,

in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the cancer slope factor. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Cancer slope factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied. Table 2 contains the cancer slope factors for carcinogenic contaminants of concern at the Site.

Reference doses (RfDs) have been developed by U.S. EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of the daily exposure to the human population (including sensitive subpopulations) that is likely to be without an appreciable risk of deleterious effects during a lifetime. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur. The reference doses for contaminants of concern at the Site are specified in Table 2.

4. Risk Characterization

Using the maximum levels of each contaminant detected in the groundwater for each respective calculation, the excess cancer risk and noncancerous effects were calculated for current and future scenarios. Under current use conditions, the groundwater data used was from monitoring wells located near and far downgradient from the Site. The cancer risk due to the ingestion of groundwater near downgradient is 2 X 10[-4].

The cancer risk due to the inhalation of VOCs from showering is 2 X 10[-5]. The hazard index for ingestion of near downgradient groundwater is 3, and far downgradient groundwater is 10. The higher hazard index for far downgradient groundwater (10) is the result of higher contaminant concentrations detected in far downgradient wells. Higher contaminant concentrations in far downgradient wells may possibly be due to downward vertical gradients of the plume. The hazard index numbers indicate that exposure to contaminants may produce harmful, non-cancerous effects.

Accordingly, under future-use conditions, it is assumed that residential housing would be developed around the Site. The groundwater data collected from on-property wells were used to calculate the risk for the future use scenario. The cancer risk through the ingestion of groundwater in shallow wells is 2 X 10[-3]. The hazard index from shallow wells located on site is 6,000. U. S. EPA considers these risks unacceptable. Table 3 contains the cancer risk and hazard index for current and future cases.

b. Environmental Risks

An ecological risk assessment was conducted to evaluate potential impacts on nonhuman receptors associated with the site. An evaluation of selected terrestrial plants and soil organisms (earthworms) to chemicals of potential concern indicated that neither plant nor earthworm populations would be adversely affected.

VII. DOCUMENTATION OF SIGNIFICANT CHANGES

No significant changes have been made since the May 1992 publication of the FS and Proposed Plan.

VIII. DESCRIPTION OF ALTERNATIVES

Based on the results of the RI and risk assessment, an FS was conducted to identify and evaluate a variety of alternatives for protecting human health and the environment from the contamination associated with the groundwater contamination at the Site. After identifying and screening potential remedial technologies for the Site, two alternatives were selected for further evaluation. The selection of these two alternatives from various remedial technologies was based on the screening process considering the remediation goal, the results of the treatability study, volume of groundwater to be treated, contaminant levels, and the merit of the technology. Each of the alternatives is evaluated using a set of nine criteria. These criteria reflect the goals of the Superfund program. They are used by U.S. EPA to compare the merits of each alternative. These criteria are explained in Section IX.

Descriptions of the two alternatives considered by U.S. EPA are provided below, including costs, estimated in terms of capital cost and annual operation and maintenance cost. Together, these dollar amounts are converted to net present worth. U.S. EPA's evaluation of each remedial alternative using the evaluation criteria is summarized in Section IX.

Due to the relatively low concentration levels of contaminants detected off-property and lack of information collected for the off-property aquifer, the groundwater contamination at the Site was separated into on- and off-property groundwater contamination. The terms "on-property" and "off property" are defined in Section II. More studies will be conducted off-property as part of the RD/RA Phase to characterize the off-property aquifer and to gather other necessary information.

The alternatives considered for the GCOU are:

Alternative 1: No Action.

Alternative 2: Groundwater extraction and treatment; Discharge of treated groundwater to the wetlands or Yahara River.

A description of each of these alternatives follows:

Alternative 1: No Action

Under this alternative, the Site would be left in its present condition and no action would be taken to reduce the risk of exposure to contamination. U.S. EPA requires consideration of a no-action alternative to serve as a basis against which other remedial alternatives can be compared. Under this alternative, groundwater-quality monitoring of selected on-property, off property, and all private wells located on and around the Site will be continued.

The capital cost of this alternative is approximately $179,000, and annual Operation and Maintenance (O&M) is $50,000. The 30-year present net worth (PNW) cost is $1,025,000.

Alternative 2: Groundwater extraction and treatment; Discharge of treated groundwater to the wetlands or Yahara River.

(a) Groundwater Extraction and Treatment

Under this alternative, on-property groundwater will be extracted and treated using an activated sludge biological system. The off-property groundwater will be extracted and treated using the treatment technology which will be selected during the Remedial Design (RD) stage. The off-property treatment technology will selected during the RD stage because additional information is needed concerning the off-property aquifer. The treated groundwater will be discharged into the wetlands or Yahara River.
The treated on-property groundwater may also be reinjected to the on-property aquifer with nutrients and/or oxygen to enhance biodegradation. The private wells located around the Site will be monitored. It is anticipated that aquifer restoration under this alternative may require a 30 year period.

Groundwater extraction will be performed by a series of groundwater extraction wells placed at strategic locations downgradient of the source of contamination. The precise location, number, and depth of these wells will be established in the RD phase. Preliminary aquifer flow analysis indicates that wells extracting 100 to 180 gallons per minute (GPM) should contain and significantly reduce the contamination within the plume.

The extracted groundwater from on-property will be treated using an activated sludge biological system. In a biological treatment process, the contaminants act as an energy source for biological microorganisms. If, over time, the contaminant concentrations become too low to support biological growth, additional materials (e.g., milk whey) may be added to maintain optimum biological activity for contaminant degradation. When influent contaminant concentrations in the biological process decrease to a level insufficient to support biological activity without large additions of substrate, a more cost-effective option may be to switch to a physical or chemical treatment process, such as Granular Activated Carbon (GAC). The biological system

should remove up to 99 percent of the contaminants in the groundwater. Prior to the biological treatment, the extracted on-property groundwater would be passed through the pretreatment facility to remove metals and inorganic solids.

In addition, the treated on-property groundwater may be enhanced with nutrients and/or oxygen and reinjected into the aquifer to promote in-situ contaminant biodegradation in groundwater and saturated soils, potentially decreasing the time necessary for extraction and treatment. The reinjected water may also help flush additional contaminants from the aquifer. Preliminary groundwater flow analysis indicated that approximately 30 percent of the total onproperty extraction volume will be treated to NR 140 Preventive Action Limits (PALs) by biological treatment and reinjected into the aquifer. Because the effectiveness of this enhancement is uncertain, full implementation should be preceded by a testing and evaluation phase to determine the feasibility of performing long-term in-situ bioremediation treatment. A bench scale study would be implemented first to determine the effect of nutrients and oxygen on contaminated groundwater. If the bench scale study shows positive results, a pilot study would be conducted with the ultimate goal of enhancing the selected remedy with an in-situ groundwater bioremediation system.

For the treatment of extracted off-property groundwater, the following five technologies will be evaluated:

Option 2A: Cascade Aeration
Option 2B: Biological Treatment
Option 2C: Air Stripping
Option 2D: Granular Activated Carbon (GAC)
Option 2E: Ultraviolet (UV)-Chemical Oxidation

Option 2A: Cascade Aeration

The cascade aeration system utilizes a modified pipeline with an open channel gravity flow section in order to strip the VOCs in the groundwater. This flow section would create turbulence in the water and enhance air-water contact prior to discharge to the Yahara River. This open channel segment would promote the transfer of volatile contaminants to the air. It is expected that the cascade aeration system is not as efficient as the air stripping process evaluated in the treatability study, and would remove less than 40 percent of the THF in the off-property groundwater. Pretreatment for metals and inorganic solids would be necessary prior to cascade aeration. Since cascade aeration has a low removal rate for THF, the treated groundwater using cascade aeration will not be discharged into the wetlands.

Option 2B: Biological Treatment

Off-property groundwater would be combined with more highly contaminated groundwater from on site, pretreated to remove metals and inorganic solids, and then biologically treated to remove the organic compounds. If combined groundwater contamination concentrations from both on- and off property become too low to support biological growth, additional substrate material may be added to maintain optimum biological activity for contaminant degradation.

Option 2C: Air Stripping

Off-property groundwater would first be pretreated to remove metals and inorganic solids, and then conveyed to a packed-tower air stripper which uses countercurrent aeration, in which influent water flows into the top of the tower and cascades through a packing media, while air is forced upward through the tower. This allows a transfer of contaminants in the liquid phase to the gas phase by providing a larger contact surface and void volume for phase transfer of the contaminants and a sufficient residence time for the transfer to occur. The air stripping could reduce THF contamination by up to 40 percent and remove other less soluble VOCs by greater amounts. The treated groundwater using air stripping will not be discharged to wetlands due to the low removal rate.

Option 2D: Granular Activated Carbon (GAC)

Off-property groundwater would first be pretreated to remove metals and inorganic solids, and then conveyed

to the GAC bed, where contaminants are adsorbed on the carbon. When the capacity of the carbon is exhausted, the bed is taken out of service and the spent carbon either regenerated or disposed of in an off-site landfill to meet the Land Disposal Restriction requirements. Based on the treatability study, the GAC would remove up to 99 percent of the contaminants in the groundwater. However, the main contaminant in the off-property groundwater, THF, is not readily adsorbable, and will require large quantities of GAC for complete adsorption.

Option 2E: Ultraviolet (UV)-Chemical Oxidation

Chemical oxidation and UV light would be used to destroy VOCs in the contaminated off-property groundwater. Chemical oxidation uses strong oxidizing agents to react and destroy organics in groundwater. UV light would be used in conjunction with the oxidizing agents (such as hydrogen peroxide and ozone) to improve the oxidation process efficiency. The treatability study for on-property groundwater indicated that data from vendors show that UV/peroxide oxidation with pre-filtration was able to remove THF concentrations as high as 57,000 ug/l. This technology should remove up to 99 percent of the contaminants from the extracted off-property groundwater. Consequently, this process will need to be preceded by an inorganics removal pretreatment process such as air oxidation/precipitation or pH adjustment to remove metals which could cause scaling on ultraviolet lamps.

(b) Selection of Off-Property Groundwater Treatment Technology

U.S. EPA, in consultation with WDNR, will select the off-property groundwater treatment technology from the five technologies described above. The selection of the technology will be based on design information including, but not limited to, an off-property pump test, off-property treatability study, and bio-assay test. U.S. EPA will consider the off-property aquifer characteristics, the surface water discharge limits for the contaminants of concern for discharge to the Yahara River, groundwater discharge limits for the contaminants of concern for discharge to wetlands, and the ability of these technologies to meet ARARs. After selection of the off-property groundwater treatment technology, the U.S. EPA will issue an explanation of significant differences (ESD) to inform the public of U.S. EPA's decision.

(c) Discharge of Treated Groundwater

The treated on- and off-property groundwater could be discharged to the Yahara River through an 11,000-foot force main water line which must, at some point, tunnel beneath the Chicago, Milwaukee, St. Paul, and Pacific Railroad line which lies between the Site and the Yahara River. The cascade aeration treatment system would replace a segment of the force main if that treatment system is selected for off-property groundwater. The treated groundwater could also be discharged into wetlands.

The discharge location will be determined after a Site specific evaluation including an evaluation of the impact of ARARs on the design of the groundwater extraction and treatment system and effluent discharge limits.

(d) Groundwater Cleanup and Discharge Standards

Groundwater will be extracted until the groundwater no longer attains or exceeds Wisconsin NR 140 PAL standards at the point of compliance and beyond. Consistent with the exemption criteria of NR 140.28, WAC, an alternative concentration limit (WACL) may be established if it is determined that it is not technically or economically feasible to achieve the PAL for a specific substance. The point of compliance shall be the waste management boundary.

Discharge of treated groundwater to the Yahara River will be required to comply with the requirements set forth in a WPDES permit, since discharge to the Yahara River would be considered an off-site discharge.

Discharge of treated groundwater into the wetlands via the drainage ditch near the southeast corner of the Site or directly to the wetlands will be required to meet the substantive requirements of a WPDES permit and shall comply with NR 140, PAL standards. In addition, the State of Wisconsin also has policies on protection of wetlands which shall be complied with for actions affecting wetlands including NR 1.95 and 103 Wis. Adm.

Code. Impacts to the wetlands will be considered and minimized to the extent possible during the design phase of this remedial action as directed in Executive Order 11990.

(e) Air Emission Treatment

The emitted gases produced by waste water treatment system will be treated to meet State air-quality standards in accordance with the Clean Air Act (CAA) and NR 400 through 499, WAC.

(f) Sludge Management

All residue, sludge, and/or spent coagulants/agents from the treatment of groundwater shall be treated to meet the Land Disposal Restriction (LDR) standards for F003-F005 wastes prior to disposal in a Resource Conservation and Recovery Act (RCRA) landfill in accordance with the requirements of 40 CFR 268.41. Spent carbon will be regenerated or treated to meet the LDR requirements.

(g) Cost

Depending on the selection of off-property groundwater treatment options and the location of discharge of treated groundwater, the cost of this alternative will vary. The detailed cost information is contained in Table 4. The capital costs range from $4,396,000 to $6,288,000, annual O&M costs range from $550,000 to $1,027,000, and 30-year total PNW cost ranges from $13,612,000 to $24,163,000.

IX. SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

A detailed analysis was performed on the two alternatives using the nine evaluation criteria in order to select a groundwater control remedy. The following is a summary of the comparison of each alternative's strength and weakness with respect to the nine evaluation criteria. These nine criteria are:

1) Overall Protection of Human Health and the Environment
2) Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)
3) Long-Term Effectiveness and Permanence
4) Reduction of Toxicity, Mobility, or Volume through Treatment
5) Short-Term Effectiveness
6) Implementability
7) Cost
8) State Acceptance
9) Community Acceptance

1. Overall Protection of Human Health and the Environment

Alternative 1, No Action, will not provide adequate protection from risks associated with contaminated groundwater. The private wells located downgradient of the Site might be exposed in the future. Therefore, it will not be discussed any further, since it is not protective and, thus, not an acceptable alternative. Additional contaminant loading into the aquifer will, however, be reduced by implementation of the cap and ISVE system determined in the ROD of the SCOU.

Alternative 2 provides protection of human health and the environment because it includes an extraction and treatment system to remove and treat the contaminated groundwater from the aquifer.

2. Compliance with ARARs

Alternative 2 would comply with all applicable or relevant and appropriate federal and state environmental laws.

The major groundwater ARARs include the Federal Safe Drinking Water Act (SDWA) and State Groundwater Quality Standards, NR 140, WAC.

The major surface water discharge ARARs include Chapter 147 Wisconsin Statutes, NR 102, 104, 105, 106, 108, 200, 207, 219, and 220 of WAC.

The major wetland discharge ARARs include NR 1.95, 103, and 140 (PAL Standards) of WAC, and the substantive requirements of a WPDES permit (Chapter 147 Wisconsin Statutes, NR 102, 104, 105, 106, 108, 200, 207, 219, and 220 of WAC).

The groundwater wells for the alternatives will be constructed according to the standards listed in NR 112 and 141, WAC. Wastewater treatment facility standards will be followed according to NR 108, WAC.

Water used for in-situ bioremediation will be treated to achieve NR 140, PALs prior to re-injection into the aquifer. Any proposal to re-inject treated groundwater enhanced with nutrients and/or oxygen must comply with the substantive requirements of Ch. NR 112, WAC. Feasibility and evaluation testing of in-situ bioremediation should be evaluated during implementation of the remedial action.

NR 445, Control of Hazardous Pollutants, is an ARAR for Alternative 2. Off-gases generated from the treatment process should be treated in order to meet NR 445 emission limit requirements. In general, NR 400 to 499, WAC (Air Quality Management) is an ARAR for the emission of off-gas.

A more complete list of ARARs is included in Section XI.

3. Long-term Effectiveness and Permanence

Cascade aeration and air stripping may require consideration of the residual risks due to potential exposure to the community. This exposure may occur through inhalation of volatilized contaminants from the aeration channel and air stripper, respectively, if they exceed NR 445 standards. Alternative 2 also has a risk component due to the residual contamination in the water being discharged to the Yahara River. The risk due to the implementation of air stripping may be slightly less than from cascade aeration because the air stripper is expected to remove more contaminants than the cascade aeration system.

Potential risks exist for all treatment options due to the transport, storage, and disposal of pretreatment and treatment process residuals which may be hazardous waste. The level of risk is approximately proportional to the quantities of waste generated. The GAC has greater potential risk because it generates residuals from activated carbon treatment process. Biological treatment, air stripping, and UV-chemical oxidation generate slightly less treatment process residuals. Cascade aeration generates the smallest volume of potentially hazardous waste because there might be no pretreatment process for the water, and the cascade aeration treatment process generates no residuals.

There is no difference between the effectiveness of the institutional controls or the proposed groundwater monitoring for any of the treatment options in Alternative 2.

The surface water discharge limits, which will be established by U.S. EPA in consultation with WDNR, will determine whether the contaminant removal levels for off-property groundwater treatment options, cascade aeration and air stripping, are adequate. Treatment options such as biological treatment, GAC, and UV-chemical oxidation should be adequate for treatment to the required discharge limits.

4. Reduction in Toxicity, Mobility, or Volume

Alternative 2 uses a groundwater well extraction network to remove contaminated groundwater from the ground and a biological treatment process to remove organics from the extracted on-property groundwater. Pretreatment would be included and would likely consist of a precipitation process to remove inert solids and metals.

The amount of hazardous materials extracted from the groundwater aquifer is the same, regardless of which treatment option in Alternative 2 is selected.

The biological treatment system proposed to treat extracted groundwater from on-property is expected to

remove up to 99 percent of the contaminants in the groundwater. Based upon the treatability study, the cascade aeration system proposed for off-property groundwater is expected to be less efficient than air stripping. Cascade aeration is expected to remove less than 40 percent of the THF in the off-property groundwater. It is also expected to remove the less-soluble VOCs (e.g., vinyl chloride) in the contaminated off property groundwater. The biological treatment is expected to remove up to 99 percent of the contaminants in the off-property groundwater. The air stripper system is expected to remove up to 40 percent of the THF and provide even greater reduction of other less-soluble VOCs in the contaminated groundwater. The GAC treatment system and the UV-chemical oxidation system is expected to remove up to 99 percent of the contaminants from the extracted off-property groundwater. Removal efficiencies are based upon the treatability study, which was conducted using on-property contaminant concentrations. Actual removal efficiencies are dependent upon field conditions, and would need to be further evaluated in the RD phase.

Reduction of hazardous materials through in-situ bioremediation cannot be estimated at this time. Evaluations of the effectiveness of insitu bioremediation will be made in the in-situ bioremediation pilot testing phase conducted when the GCOU extraction system has equilibrated. Prior to conducting the in-situ bioremedial pilot testing phase, groundwater injection should be performed and the system allowed to reach equilibrium. An evaluation to assess the incremental benefit attributable to reinjection without the addition of nutrients and/or oxygen can then be made.

Alternative 2 will reduce the toxicity and volume of the contamination in the aquifer, and limit additional contaminant migration.

In-situ bioremediation may increase the rate of in-situbiodegradation. This potential for increased biodegradation will be evaluated by feasibility testing in the RA implementation phase.

The extraction of contaminated groundwater and subsequent treatment for all treatment options is irreversible. In-situ biodegradation reactions for the treatment of organic compounds is also irreversible.

In-situ bioremediation has the potential to reduce groundwater concentrations below those achievable by extraction alone. However, some residual contaminants are expected to remain under any extraction or in-situ treatment method.

The pretreatment system and biological treatment system for on property groundwater treatment will produce an estimated 550 pounds per day of metal and inorganic residuals, which may be hazardous. The biological treatment system is expected to produce an estimated 170 pounds per day of potentially hazardous sludges due to inclusion of the off-property groundwater in the treatment process. The air stripping system, GAC, and UV-chemical oxidation are each expected to produce an additional estimated 200 pounds per day of potentially hazardous sludges. Sludge generation rates are based on sludge generation data gathered in the treatability study. GAC is also estimated to produce 75 pounds per day of spent carbon from the GAC process.

All Alternative 2 options will reduce the inherent hazards posed by the groundwater contamination at the Site to risk levels considered protective of human health and the environment through groundwater extraction and treatment.

Activated sludge biological treatment would utilize the ability of certain bacteria to break down organic compounds into carbon dioxide and water. Cascade aeration and air stripping involve the transfer of volatile contaminants to the air. The contaminants in the off-gas could be adsorbed in the carbon and treated if spent carbon is regenerated. Regeneration usually involves heating the carbon to very high temperature in a kiln to desorb the contaminants. The desorbed contaminants can then be incinerated. GAC utilizes the adsorption process in which molecules in an aqueous solution adhere to the surface of a solid. The contaminants which adhered in the surface of a carbon bed can be treated through a regeneration process. UV oxidation involves the use of UV radiation in conjunction with one or more oxidizing agents, usually ozone or hydrogen peroxide, to chemically destroy organic contaminants. Ozone and hydrogen peroxide are both strong oxidizing agents that can chemically break down organic compounds. In the presence of UV radiation, the effectiveness of these oxidizing agents is dramatically increased.

5. Short-term Effectiveness

Risks to the community from Alternative 2 are due to the off-site transport of sludges and treatment residues generated by the pretreatment and/or treatment processes for each treatment option. The level of risk is approximately proportional to the quantities of wastes generated.

Alternative 2 should cause no additional risks to workers beyond normal risks associated with construction, provided that a Health and Safety Plan is developed and followed.

The disturbance of the wetlands due to monitoring and extraction well construction could occur during the construction of Alternative 2, depending upon well locations. Wetlands may also be damaged during winter months by ice buildup from continual water discharges to wetlands from the treatment of the biological system, GAC, or UV-chemical oxidation. Such damage should not occur if preventative measures such as intermittent pumping or engineered control systems (e.g., stilling basins) are employed. Such damage could be avoided entirely if treated wastewater is discharged to the Yahara River instead of the wetlands. These potential impacts to the wetlands will be evaluated during the RD phase and will be minimized.

For Alternative 2, the time required to achieve the RA objectives is limited by the extraction technology, as described in Alternative 2. Remediation times are described in terms of advective flushing times. The effects of retardation and dispersion are not accounted for in the groundwater remediation time estimates. Advection flushing time is between 10 and 15 years for Alternative 2. The addition of in-situ bioremediation may decrease the remediation time to between 5 and 10 years. Actual cleanup time will likely be substantially longer due to the effects of retardation and dispersion, although these effects may be offset by the degradation stimulated by in-situ bioremediation.

6. Implementability

The extraction well network for Alternative 2 is readily implementable.

The technologies required to implement the treatment system for Alternative 2 and its off-site treatment option are readily available, although the biological treatment system requires a start-up period before it reaches the optimum operating efficiency. If intermittent pumping is required to reduce impacts to the wetlands, operation of a biological treatment system will be difficult to control. However, intermittent pumping of individual wells should be possible without causing operational problems.

A testing and evaluation period is needed to determine if in-situ bioremediation is technically feasible before full-scale implementation. The biological treatment system which reduces contaminant levels to required discharge levels may require modifications as groundwater contaminant levels decrease over time. All off-property treatment options may require a pilot scale test to establish operation parameters of treatment technology.

Discharge standards to the Yahara River need to be determined before it will be known whether treatment options, such as cascade aeration or air stripping, meet surface water discharge standards.

Alternative 2 requires additional materials and services. However, these materials are expected to be readily available. If shown to be feasible, in-situ bioremediation utilizes materials and services available from the consulting and environmental services communities.

7. Cost

The cost of each alternative is summarized in Table 4.

8. State Acceptance

The WDNR concurs with the selection of Alternative 2 on the condition that the WDNR determines, at the time the proposed treatment design is finalized, that the effluent discharge limits and discharge location (including any reinjection of enhanced groundwater which is proposed) are acceptable to the WDNR and are in

compliance with the effluent discharge limit requirements of Chapters NR 102, 104, 105, 106, 108, 200, 207, 219 and 220, WAC, Ch NR 140, WAC, PAL Standards, the wetlands protection in Ch NR 103 WAC, and the applicable air quality standards in Chs NR 400 to 499, WAC.

9. Community Acceptance

The specific comments received and U.S. EPA's responses are outlined in the attached Responsiveness Summary.

X THE SELECTED REMEDY

As provided in CERCLA and the NCP, and based upon the evaluation of the RI/FS and the nine criteria, U.S. EPA, in consultation with the WDNR, has selected Alternative 2 as the groundwater control remedial action at the Hagen Farm Site.

- Institutional controls would include on-property land and on- and off-property groundwater use restrictions in the form of existing deed restrictions to the extent necessary to implement andprotect the remedy, and to safeguard human health and the environment during implementation of the remedy. The cooperation of local agencies would be required to limit future off-property use of groundwater if the Respondents are unable to obtain deed restrictions from affected property owners. A fence shall be installed around the treatment facility system in order to prevent public access.

- Additional monitoring will be conducted in the selected on- and off-property monitoring wells and all of the private wells located around the Site, including but not limited to, the wells located on the properties of Fosdohl, Lee, Van Deusen, Sundby, Sundby Sand and Gravel, K-Way Insulation, Gullickson, Quam, Stoughton Conservation Club, Sagmoen, and Gjertson.

- Extracted groundwater from on- and off-property would be pretreated for the removal of metals and inorganic solids.

- On-property groundwater will be extracted until the groundwater at the waste management boundary and beyond (area of attainment) no longer attains or exceeds Wisconsin NR 140 PAL standards, and treated using an activated sludge biological system. All residue and/or sludge shall be treated as appropriate to meet the LDR standards for F003-F005 wastes and shall be placed in a RCRA landfill in accordance with the requirement of 40 CFR 268.41.

- Off-property groundwater will be extracted until the groundwater within the area of attainment no longer attains or exceeds Wisconsin NR 140 PAL standards and treated using an appropriate treatment technology. Treatment technologies such as cascade aeration, activated sludge, air stripping, GAC, or UV-oxidation shall be evaluated during the RD stage. Based on the off-propertypump test, bioassay test, BAT requirements, surface water discharge limits, and other related factors, the technology will be selected for off-property groundwater treatment. The emitted gases will be treated to meet State air-quality standards of NR 445, WAC. All residue, sludge, and/or spent coagulants shall be treated as appropriate to meet the LDR standards for F003-F005 wastes and shall be placed in a RCRA landfill in accordance with the requirement of 40 CFR 268.41. The spent carbon could be regenerated or treated to meet LDR requirements prior to land disposal.

- A bench scale study will be conducted to examine the feasibility of injecting the treated on-property groundwater into the on-property aquifer in order to enhance in-situ bioremediation. Nutrients and/or oxygen would be added in order to promote the natural microbial degradation of organic compounds. The study will be designed to determine the optimum amounts of nutrients to be added to the aquifer, and the amount of groundwater to be injected. If determined to be feasible, a pilot study would be implemented with the ultimate goal of enhancing the selected remedy with a full scale in-situ groundwater bioremediation system. The discharge limit of NR 140, PAL standards shall be met in order to inject treated groundwater into the on-property aquifer.

- The treated groundwater will be discharged to the Yahara River or nearby wetlands. Discharge of treated groundwater into the wetlands via the drainage ditch near the southeast corner of the Site or directly to the wetlands should meet the substantive requirements of a WPDES permit and shall comply with NR 140, PAL standards. In addition, the State of Wisconsin also has policies onprotection of wetlands which shall be complied with for actions affecting wetlands including NR 1.95 and 103, Wis. Adm. Code. Impacts to the wetlands will be considered and minimized to the extent possible during the design phase of this remedial action as directed in Executive Order 11990. Discharge of treated groundwater to the Yahara River will be required to comply with the requirements set forth in a WPDES permit, since discharge to the Yahara River would be considered an off-site discharge.

XI. STATUTORY DETERMINATIONS

The selected remedy must satisfy the requirements of Section 121 of CERCLA to:

a. protect human health and environment;
b. comply with ARARs;
c. be cost effective;
d. utilize permanent solutions and alternate treatment technologies to the maximum extent practicable; and,
e. satisfy the preference for treatment as a principal element of the remedy or document in the ROD why the preference for treatment was not satisfied.

The implementation of Alternative 2 at the Site satisfies the requirements of CERCLA as detailed below:

a. Protection of Human Health and the Environment

This selected remedy will provide adequate protection of human health and the environment through treatment.

Risk posed by groundwater contamination will be reduced and controlled by the operation of a groundwater extraction and treatment system. Access restrictions will prevent direct contact with contaminated groundwater until groundwater cleanup standards are met.

No unacceptable short-term risks will be caused by implementation of the remedy. Standard safety programs, such as fencing, use of protective equipment, monitoring, and off-gas treatment, should mitigate any short-term risks. Short-term risks include exposure of site workers and the community to VOCs, and to noise nuisance during implementation of the groundwater remedy. Ambient air monitoring would be conducted and appropriate safety measures would be taken if contaminants were emitted.

b. Compliance with ARARs

The selected remedy complies with all Federal and State environmental requirements that are legally applicable or relevant and appropriate. The major Federal and State ARARs for the selected remedial alternative for the GCOU are listed below.

A) Federal ARARs

i. Groundwater

Relevant and appropriate requirements for groundwater include primary drinking water standards established by the federal SDWA. Several contaminants of concern identified at the Site have Maximum Contaminants Level (MCLs), proposed MCLs and/or Maximum Contaminant Level Goals (MCLGs). MCLs are relevant and appropriate to circumstances at the Site, since the aquifers are current and potential sources of drinking water. MCLGs are relevant and appropriate when the standard is set at a level greater than zero (for noncarcinogen).

The NCP 40 C.F.R. 300 et seq. provides that groundwater cleanup standards should generally be attained throughout the contaminant plume or at and beyond the edge of the waste management area when waste is left in place. At the Hagen Farm Site, groundwater quality Standards shall be attained at and beyond the edge of the waste management area (i.e., at the edge of the landfill cap) since waste has been left in place. This is considered the area of attainment.

ii. Surface Water Discharge

Surface water quality standards for the protection of human health and aquatic life were developed under Section 304 of the Clean Water Act (CWA). The Federal Ambient Water Quality Criteria (AWQC) are nonenforceable guidelines that set pollutant concentration limits to protect surface waters that are applicable to point source discharges, such as from industrial or municipal wastewater streams.

National Pollutant Discharge Elimination (40 CFR Part 125); includes best available technology.

iii Wetlands Discharge

Executive Order 11990, 40 CFR 6.302 (a) - Protection of Wetlands is applicable for this site if the discharge of treated groundwater is to the wetlands.

iv. Sludges

All sludges, residues, spent carbon, and/or spent coagulants produced from groundwater and off-gas treatment will be treated to LDR standards for F003-F005 waste prior to disposal at a RCRA landfill in accordance with the requirement of 40 CFR 268.41. If testing determines that waste sludge generated from the activated sludge biological system is not hazardous, the waste sludge could be disposed of by on-Site landspreading or off-Site landfilling. Residues such as spent carbon from the treatment of groundwater which are regenerated must be treated in a unit in compliance with 40 CFR Part 264 Subpart X. Federal ARAR 40 CFR Part 261 - Land Disposal Restrictions shall also be complied with.

The sludge is not expected to contain metals at concentrations above characteristic levels. If, after testing by the Toxicity Characteristic Leaching Procedure (TCLP), it is determined that the sludge is characteristic for metals, it will be treated to render it non hazardous.

v. Air Emissions

National Primary and Secondary Ambient Air Quality Standards (40 CFR Part 50)

National Emissions Standards for Hazardous Air Pollutants (40 CFR Part 61)

B) State ARARs

i. Groundwater

The State of Wisconsin is authorized to administer the implementation of the Federal SDWA. The State has also promulgated groundwater quality standards in NR 140 Wis. Adm. Code, which, according to WDNR, is being consistently applied to all facilities, practices, and activities which are regulated by WDNR and which may affect groundwater quality in the State. Chapter 160, Wis. Stats., directs WDNR to take action to prevent the continuing release of contaminants at levels exceeding standards at the point of standards application (point of compliance). PALs and Enforcement Standards (Ess), have been promulgated in NR 140, Wis. Adm. Code. PALs are the groundwater cleanup standards under NR 140. PALs are generally more stringent than corresponding Federal standards and, therefore, are ARARs for the Hagen Farm Site.

Consistent with the exemption criteria of NR 140.28, Wis. Adm. Code, U.S. EPA may establish a Wisconsin Alternative Concentration Limit (WACL), if, based on Site-specific monitoring data gathered before and after implementation of the selected groundwater remedy, U.S. EPA determines that it is not technically and economically feasible to achieve the PALs for a specific substance. Except where the background concentration of a compound exceeds the ES, and consistent with the criteria in NR 140. 28(4)(B), the WACL that is established may not exceed the ES for that compound.

The implementation of the selected remedy at the Site will be in compliance with NR 140, Wis. Adm. Code, in that PALs will be met unless WACLs are established pursuant to the criteria in NR 140.28, Wis. Adm. Code, in which case the WACLs will be met. These standards will be met in accordance with the NCP at and beyond the edge of the waste management area.

Groundwater Monitoring and Recovery Well requirements include NR 112, NR 141, NR 508, Wis. Adm. Code. Groundwater monitoring wells will be installed in accordance with NR 141, Wis. Adm. Code. Extraction and injection wells will be installed and operated in accordance with Ch. NR 112, Wis. Adm. Code.

Wastewater treatment facility will followed according to NR 108, WAC.

In order to reinject the treated groundwater into the on-property aquifer PALs under NR 140, WAC shall be achieved.

ii. Surface Water Discharge

A WPDES permit must be obtained before treated groundwater can be discharged to the Yahara River. Discharge to the Yahara River would be considered an off-site discharge.

The substantive requirements of WPDES for discharge of wastewater (treated groundwater) to the land and/or surface waters; effluent limits; discharge permits; sampling/testing methods is regulated by Ch. 147, Statutes - Wastewater Management Programs and Chs. NR 102, 104, 105, 106, 108, 200, 207, 219, and 220, WAC Surface Water Discharge Regulations (WPDES). These requirements are all applicable to the discharge of treated groundwater to the Yahara River. Ch. NR 220, WAC, requires that the effluent limits be based on the application of best available technology (BAT) prior to discharge. The State has promulgated Wisconsin Water Quality Standards and Criteria (WWQC) under Chapters NR 102 and 105, WAC, and the procedures for calculating the toxic effluent limits under Ch. NR 106, WAC, based on the Federal AWQC developed by U.S. EPA. NR 102, 104 and 207 WAC also apply in determining water quality based limits.

iii Wetlands Discharge

Discharge of treated groundwater to the on-site ditch or adjacent to the wetlands should meet the substantive requirements of a WPDES permit and shall comply with Ch. NR 140, PAL standards. In addition, Ch. NR 1.95, WAC - Wetlands Preservation, Protection, and Management and Ch. NR. 103 - Water Quality Standards for Wetlands are applicable for this site if treated groundwater is discharged to the wetlands.

vi. Air Emissions

The emitted gases produced by waste water treatment system(s) will be treated to meet State air-quality standards in accordance with the Clean Air Act (CAA) and NR 400 through 499, WAC.

v. Miscellaneous State ARARs

. Discharge structures or other structures in a navigable water (Chapter 30, Wis. Adm. Code)

. Ch. NR 27, WAC, the State Endangered and Threatened Species Act and Ch. NR 29, WAC, the State Fish and Game Act are State endangered resource laws which protect against the "taking" or harming of endangered or threatened wildlife resources in the area. These would be applicable to the remedial action in that the poisoning of endangered or threatened species by site contaminants could be considered by the WDNR to be a "taking".

C) "To be Considered" Requirements

CERCLA Off-site Policy. (May 12, 1986), Revised November 13, 1987, OSWER DIR. 9834.11.

"Interim Policy for Promoting the In-State and On-Site Management of Hazardous Wastes in the State of Wisconsin" provides a prioritization outline for the treatment and disposal of hazardous wastes and is "to-be considered" for the site. If out-of-state treatment and/or disposal for the generated sludges is determined, the written documentation of how the waste management strategy and the eight evaluation criteria were applied shall be submitted to the WDNR for review and approval.

C. Cost Effectiveness

Cost effectiveness compares the effectiveness of an alternative in proportion to its cost of providing environmental benefits. Table 4 lists the costs associated with the implementation of the remedies.

The selected remedy is cost effective because it provides a high degree of overall effectiveness proportional to its costs. The estimated cost of the selected remedy is comparable with the other alternatives and assures a high degree of certainty that the remedy will be effective in the longterm due to the significant reduction of the toxicity of the contaminants in groundwater.

D. Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

U.S. EPA believes that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for the RA at the Site. Treatment of contaminated groundwater will significantly reduce the hazards posed by the contaminated groundwater at the Site. The groundwater will be restored to the acceptable level to protect public health and the environment. U.S. EPA has determined that the selected remedy provides the best balance of tradeoffs in terms of long-term effectiveness and permanence, reduction of toxicity, mobility or volume through treatment, short-term effectiveness, implementability, cost, and State and community acceptance.

E. Preference for Treatment as a Principal Element

The selected remedy for the Site satisfies the statutory preference for treatment as a principal element through treatment of the contaminants in the groundwater. Treatment of the on-property groundwater contaminants using an activated biological sludge system will result in a significant reduction of contaminants in the groundwater. Treatment of the off-property contaminants using the technology selected during the RD stage will result in a significant reduction of contaminant toxicity in the off-property groundwater.

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES
101 South Webster Street
Box 7921
Madison, Wisconsin 53707

SUPERFUND/SOLID WASTE FAX 608-267-2768
TELEPHONE 608-266-2621

Carroll D. Besadny
Secretary

September 28, 1992

Mr. Valdas V. Adamkus, Administrator
U.S. EPA Region V
77 W. Jackson
Chicago, Ill 60604

SUBJECT: Concurrence on The Selected Groundwater Control Remedy, Hagen Farm Site, Town of Dunkirk, Dane Co., WI

Dear Mr. Adamkus:

The Department is providing you with this letter to document our concurrence with the remedy selected for the groundwater control operable unit at the Hagen Farm Superfund site. The proposed groundwater remedy, as outlined in the June, 1992 Proposed Plan, will address the contaminated groundwater both on and off site, and is considered the final remedy for the groundwater at the site. The selected remedy is alternative 2, which includes:

- Groundwater use restrictions in the form of deed restrictions to the extent necessary to implement and protect the remedy;
- Installation of a fence around the treatment system;
- Additional monitoring to determine the depth and extentof off-site contamination;
- A series of groundwater extraction wells both on and offsite designed to actively restore the groundwater in both areas;
- Pretreatment of all extracted groundwater for the removal of metals and inorganic solids;
- Treatment of the on-site extracted groundwater in an activated sludge biological treatment facility constructed at the Hagen Farms site;
- A bench scale study examining the feasibility of injecting the treated on-site groundwater into the aquifer below the site in order to enhance in-situ bioremediation;
- Treatment of off-site extracted groundwater using an appropriate treatment technology. This technology has not yet been determined but options include cascade aeration, activated sludge, air stripping, granular activated carbon (GAC) or UV-oxidation;
- Treatment of residue, sludge, and/or spent coagulates to meet land disposal requirements, followed by disposal in a RCRA landfill; and
- Discharge of all treated groundwater to the Yahara River or nearby wetlands.

The range of costs for the selected remedy are estimated to be as follows:

Capital Cost	$ 4,396,000 - $6,288,000
Annual O&M 1st year	$ 550,000 - $ 1,062,000
Total Present Worth	$ 13,612,000 - $ 24,163,000
Estimated time to implement	30+ Years

Though the Department concurs with the selection of this remedy, WDNR concurrence is based upon the understanding that at the time the proposed treatment design is finalized, the effluent discharge limits and discharge location (including any reinjection of enhanced groundwater which is proposed) are acceptable to the WDNR and are in compliance with the effluent discharge limit requirements of Chapters NR 102, 105, 106, 207 and 220, the wetlands protection in Ch NR 103, and the applicable air quality standards in Chs NR 400 to 499, WAC. Our concurrence is also conditioned on EPA's supplementation of that portion of the administrative record that pertains to off-site groundwater extraction and treatment with all documents submitted by the WDNR in the future dealing with off-site groundwater extraction and treatment, in accordance with 40 CFR 300.825(a)(1). In addition, the Department recommends that the potential to discharge to a municipal sewerage system be further investigated during the remedial design.

We understand that if the potentially responsible parties (PRPs) do not agree to fund the remedy, it will be necessary for the State of Wisconsin to contribute 10% of the remedial action costs associated with the actions and 10% of the O&M costs for the first 10 years of groundwater extraction and treatment. In addition, if the PRPs do not agree to fund the O&M, the State of Wisconsin will need to contribute 10% of all other O&M costs for the first year and provide for all O&M after that, provided that no changes to the National Contingency Plan are made that would require an alternative cost allocation. We provide assurance of the State's willingness to provide this required state cost share on the assumption that U. S. EPA will pursue all feasible enforcement actions against the PRPs prior to expending the Fund at the site.

We understand that if the Fund is expended to conduct the remedy and if hazardous waste needing disposal is required to be managed off-site as part of the remedy, that the State of Wisconsin will be required to provide the assurances for hazardous waste management in 40 CFR 300.510(d) and (e) of the National Contingency Plan. The assurances are that a compliant hazardous waste facility is available, and that facility's use is consistent with our approved Capacity Assurance Plan. In addition, the Department recommends that an analysis and a finding be made during remedial design on whether hazardous wastes can be managed in-state and on-site, to the extent practicable. Hazardous waste residuals may be generated by the pretreatment of extracted groundwater prior to treatment, and sludge generated during the treatment of groundwater may constitute hazardous waste. We also understand that our staff will continue to work in close consultation with your staff during the pre-design, design and construction phases of the remedy.

Thank you for your support and cooperation in addressing the contamination problem at the Hagen Farm site. Should you have any questions regarding this matter, please contact Jane Lemcke, Superfund Remedial Unit Leader, at (608) 267-0554.

Sincerely,

C. D. Besadny
Secretary

cc: Lyman Wyble - AD/5
Linda Meyer - LC/5
Paul Didier - SW/3
Mike Schmoller - SD
Mary Pat Tyson - U. S. EPA Region V, 5HS/11
Mark Giesfeldt - SW/3
Jane Lemcke - SW/3
Paul Kozol - SW/3